CLAIMS:

1. A method for manufacturing a three-phase transformer, the method comprising the steps of:

(i) producing two substantially plate-like elements of a magnetic circuit of the transformer in the form of toroids by winding at least one magnetic strip;

(ii) producing each of three column-like elementary circuits of said magnetic circuit in the form of toroid of a multi-layer structure by winding predetermined number *N of* packages of magnetic strips about a central axis of the toroid, each package being composed of a predetermined number *n* of layers formed by *n* strips placed on top of each other;

(iii) forming each of the columns with a radial slot filled with an insulating material;

(iv) mounting a coil block on each of the columns obtained in step (iii) to form the corresponding one of the three phases of the transformer;

(v) mounting the coil blocks carrying columns between the plate-like elements in a spaced-apart parallel relationship of the column-like toroids, such as to form a spatial symmetrical structure about a central axis of the transformer, spacers between the elements of the magnetic circuit of the transformer being filled with a material containing a magnetic powder.

2. The method according to Claim 1, wherein the magnetic strips are made of an amorphous material.

3. The method according to Claim 2, and also comprising the steps of:

- annealing each of the plate-like toroids in a magnetic field directed perpendicular to a central axis of the plate-like toroid, and carrying out impregnation of each of the annealed plate-like toroids with an organic binding material;

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- prior to performing step (iii) annealing each of the three columns in a magnetic field directed along the central axis of the column, and carrying out impregnation of each of the annealed columns with an organic binding material;

4. The method according to Claim 1, wherein said strips are made of silicon steel.

5. The method according to Claim 1, wherein the *N* packages are aligned along said central axis of the toroid with air gaps existing between each two adjacent strips, the *n* strips being placed on top of each other and being aligned along an axis perpendicular to said central axis, the strips in the package being shifted with respect to each other a predetermined distance in a direction along said central axis of the toroid such that each of the air gaps is overlapped by *(n-1)* strips aligned along the axis perpendicular to the central axis of the toroid.

6. The method according to Claim 5, wherein the number *N* of packages is defined by a width of the strip and a desired length of the toroid, such that the sum of the widths of the *N* strips in each layer is substantially equal to the length of the toroid, and the number *n* of the strips in the package is selected in accordance with the magnetic properties of the strips.

7. The method according to Claim 6, wherein the number *n* of the layers satisfies the following relation: $n \geq B_w/(B_{sat}-B_w)$, wherein *n* is integer, B_w is a working value of a magnetic induction, and B_{sat} is a saturation value of the magnetic induction in the strip.

8. The method according to Claim 6, wherein the winding of the multi-layer structure comprises the steps of :

- preparing each of the *n* layers from the *N* strips with the air gaps existing between each two adjacent strips in the layer; and
- simultaneously winding said *n* layers about a central axis of a mandrel supporting the toroid during the manufacture, by simultaneously feeding the *N* strips of each layer, such that the layers are shifted with respect to each other said predetermined distance in the direction along said central axis,

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each of the air gaps in one layer being thereby overlapped by *(n-1)* strips of the other layers of the structure.

9. The method according to Claim 8, wherein the preparation of each of the layers comprises winding the N strips on a bobbin such that the sum of the width of the strips is substantially equal to said desired height, the bobbins being aligned in a spaced-apart parallel relationship, such that the layers on the bobbins are shifted with respect to each other said predetermined distance in the direction along the axis of the bobbin.

10. The method according to Claim 1, wherein each of the column-like toroids is produced by mounting several toroidal elements on top of each other, each of said toroidal elements being produced by the winding of the strips.

11. The method according to Claim 1, wherein each of the plate-like toroids is a multi-layer structure produced by the winding of a predetermined number of packages of the magnetic strips about a central axis of the plate-like toroid, the packages being aligned along said central axis with air gaps existing between each two adjacent strips, each package being composed of a predetermined number n of layers formed by n magnetic strips placed on top of each other and being aligned along an axis perpendicular to said central axis, the strips in the package being shifted with respect to each other a predetermined distance in a direction along said central axis of the toroid such that each of the air gaps is covered by *(n-1)* strips aligned along the axis perpendicular to the central axis of the toroid.

12. The method according to Claim 11, wherein the number of packages is defined by a width of the strip and a desired length of the plate-like toroid, such that the sum of the widths of the strips in each layer, which is equal to the number of packages, is substantially equal to the length of the toroid, and the number n of the strips in the package is selected in accordance with the magnetic properties of the strips.

13. The method according to Claim 12, wherein the number n of the layers satisfies the following relation: $n \geq B_w/(B_{sat}-B_w)$, wherein n is integer, B_w is a working

value of a magnetic induction, and B_{sat} is a saturation value of the magnetic induction in the strip.

14. The method according to Claim 12, wherein the winding of the multi-layer structure comprises the steps of :

- preparing each of the *n* layers from the number of strips equal to the number of packages, with the air gaps existing between each two adjacent strips in the layer; and
- simultaneously winding said *n* layers about a central axis of a mandrel supporting the toroid during the manufacture, by simultaneously feeding the strips of each layer, such that the layers are shifted with respect to each other said predetermined distance in the direction along said central axis, each of the air gaps in one layer being thereby overlapped by *(n-1)* strips of the other layers of the structure.

15. The method according to Claim 14, wherein the preparation of each of the layers comprises winding the strips of the layer on a bobbin such that the sum of the width of the strips is substantially equal to said desired height of the plate-like strip, the bobbins being aligned in a spaced-apart parallel relationship, such that the layers on the bobbins are shifted with respect to each other said predetermined distance in the direction along the axis of the bobbin.

16. A three-phase transformer manufactured by the method of Claim 1.

17. A three-phase transformer comprising a magnetic circuit and three coil blocks, wherein the magnetic circuit comprises:

- two spaced-apart parallel plate-like elements in the form of toroids; and
- three spaced-apart, parallel column-like elementary circuits in the form of toroids, each of the column-like elementary circuits carrying the corresponding one of said three coil blocks and serving for the corresponding one of the three phases, wherein the column-like elementary circuits are substantially perpendicular to the plate-like elements and are enclosed therebetween such as to form a spatial symmetrical structure about a central axis of the transformer;

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wherein

- at least the column-like toroids are in the form of multi-layer structures, each structure being composed of an array of *N* amorphous strips packages wound about the central axis of the toroid and being aligned along said central axis, each package being a stack of *n* layers formed by *n* amorphous strips aligned along an axis perpendicular to said central axis and shifted with respect to each other a predetermined distance in a direction along said central axis such that each of air gaps naturally existing between each two adjacent strips in the layer is overlapped by *(n-1)* strips aligned along the axis perpendicular to the central axis of the toroid; and
- each of the column-like elementary circuits is formed with a radial slot filled with an insulating material.

18. The transformer according to Claim 17, wherein each of the plate-like toroids is in the form of multi-layer structure composed of an array of amorphous strips packages wound about the central axis of the toroid being aligned along a central axis thereof, each package being a stack of *n* layers formed by *n* amorphous strips aligned along an axis perpendicular to said central axis and shifted with respect to each other a predetermined distance in a direction along said central axis such that each of air gaps naturally existing between each two adjacent strips in the layer is overlapped by *(n-1)* strips aligned along the axis perpendicular to the central axis of the toroid.

19. The transformer according to Claim 17, wherein the number *N* of packages is defined by a width of the amorphous strip and a desired length of the toroid, such that the sum of the widths of the *N* strips in each layer is substantially equal to the length of the toroid, and the number *n* of the amorphous strips in the package is selected in accordance with the magnetic properties of the strips.

20. The transformer according to Claim 18, wherein the number of packages is defined by a width of the amorphous strip and a desired length of the toroid, such that the sum of the widths of all the strips in each layer is substantially equal to the

length of the toroid, and the number n of the amorphous strips in the package is selected in accordance with the magnetic properties of the strips.

21. The transformer according to Claim 17, having a modular structure, an assembling means being provided for assembling the column-like elementary circuits to the plate-like elements of the magnetic circuit, and for mounting primary and secondary windings of the coil block on the corresponding column-like elementary circuit.

22. The transformer according to Claim 17, wherein gaps between the plate-like elements and the column-like elementary circuits are filled with a magnetic paste.

23. The transformer according to Claim 22, wherein the magnetic paste is made of an amorphous powder with soft ferromagnetic properties and a binding insulating material.

24. The transformer according to Claim 19, wherein said magnetic properties of the strip include a working value of a magnetic induction, B_w, and a saturation value of the magnetic induction, B_{sat}, the required number n of the layers in the structure satisfying the following relation: $n \geq B_w/(B_{sat}-B_w)$, n being integer.

25. The transformer according to Claim 24, wherein the working value of the magnetic induction and the saturation value of the magnetic induction of the amorphous strip are, respectively, about 1.35T and 1.55T, the number n of layers being no less than 7.

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